Spring 2004

Physics 137b: Quantum Mechanics Syllabus

- Review of Hydrogen Atom
- Spin and Angular Momentum (Review for some)
  - Stern-Gerlach
  - Addition of Angular Momentum
  - Clebsch-Gordon Coefficients
- Time Independent Perturbation Theory
  - Non-degenerate
  - Degenerate
  - Fine Structure in Hydrogen
- Variational Method
- Identical Particles
  - Bosons and Fermions
  - Interchange Symmetry
- Multielectron Atoms and Molecules: More on Approximations
  - Central Field Approx
  - Periodic Table
  - LS Coupling in multielectron atoms
  - Hund's Rules
  - Lande g factor and Zeeman Effect
  - Paschen-Back Effect
  - Helium
  - Hydrogen Molecule

- WKB Approximation
- Time Dependent Perturbation Theory
  - Basic Formalism
  - Harmonic Perturbations
  - Interactions of electrons with radiation
  - Spontaneous Emission
  - Linewidths
  - Adiabatic Approximation
  - Sudden Approximation
- Scattering
  - General Framework
  - Partial Wave Analysis
  - Born Approximation
- Lasers and Masers
  - Ammonium Molecule
  - Ammonium Laser
  - Sold State Lasers
- Additional Applications to Nuclear and Particle Physics
  - $K\overline{K}$ mixing
  - Charmonium
  - Quantum Electrodynamics and Relativistic Field Theory